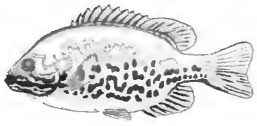
Ontario

MINISTRY OF ENVIRONMENT AND ENERGY
SCIENCE AND TECHNOLOGY BRANCH
AQUATIC SCIENCE SECTION



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BARLEY STRAW FOR ALGAE CONTROL IN PONDS

Background

Southern Ontario is dotted with thousands of ponds used for livestock watering, fish production, recreation and/or aesthetic enjoyment. Excessive algae growth is often the single most important constraint on the use of these ponds.

At the present time, a number of management options are available for controlling excessive algae growth in ponds and small lakes. These can generally be grouped into two categories: those options controlling the causes of excessive algae growth and those options which control the symptoms. While the most obvious approach to correcting algae problems is the control of excessive nutrient inputs, many ponds constructed in naturally fertile soils or ponds with a long history of high nutrient loading may not respond to the control of external nutrient sources because of a continuing input of nutrients from the pond sediments. Consequently, many pond owners have resorted to chemical control of algae.

In Ontario, the use of chemical agents for algae control is regulated under the Pesticides Act. Copper sulphate ("bluestone"), a once commonly used algicide, has been illegal in Ontario for algae control for a number of years. Other copper-based herbicides such as Algimycin and Cutrine-Plus have stringent requirements for their use (dose rates, when and where they can be applied). Another herbicide widely used in Ontario for effective algae control is Simazine. In the United States, it is being withdrawn from the market because of concern about the triazine group of chemicals (toxicity and possible carcinogenicity). Simazine will not be available in Ontario after 1995. Clearly, more environmentally friendly alternatives to chemical herbicides for algae control in Ontario would be desirable.

Recent experimental work in England has demonstrated that the aerobic decomposition of barley straw in surface waters is associated with the release of compounds which are not acutely toxic to algae, but arrest their growth (i.e., algistatic compounds).

Methods

As a test of the efficacy of barley straw for algae control in Ontario, 18 moderately hardwater ponds (alkalinity 70-220 mg $CaCO_3$) were selected in southern Ontario in 1991. An important part of the study design was the inclusion of three sets of paired ponds (adjacent upstream and downstream ponds of similar morphometry). No ponds were treated in 1991, but all were monitored (algae and nutrients). Seven ponds were treated with straw in 1992. Three of these ponds were retreated in 1993 along with one additional pond for which there then existed two years of background data. No straw additions were made in 1994; the intent was to determine if there were any carry-over effects from a treatment year into a following year. In 1995, six previously untreated ponds (four years of background data) were treated with a low dose (25 g/m^3). These results are not all available yet, so this communication presents only the findings from the higher dose rates of 65 and 180 g/m^3.

Results

The three main response variables (chlorophyll a, turbidity and phytoplankton biovolume) all showed greater decreases in ponds treated with straw than in untreated reference ponds (Figs. 1 and 2). The 1993 findings also demonstrated an apparent carry-over effect in four of the ponds treated in 1992 but not in 1993 (Fig. 2).

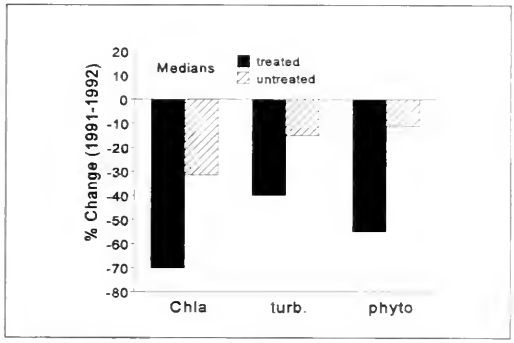

Figure 1 Percentage change in chlorophyll concentrations, turbidity and phytoplankton biovolume between 1991 and 1992 in ponds treated with straw and in untreated reference ponds.

In one of the paired pond sets this carry-over effect was in evidence for three years following the treatment in 1992 (Fig. 3). There was no change in phosphorus or nitrogen that could explain the year-to-year changes in the response variables. Algae control in ponds treated with straw apparently was not achieved by loss of available major nutrients. The median yield of chlorophyll per unit total phosphorus was twice as high in untreated reference ponds as in ponds treated with straw.

Practical Application

Until results of the experimental low dose rate (25 g/m^3) have been evaluated, a dose of 65 g/m^3 has been shown to be effective and is recommended for use in Ontario ponds. Algae control apparently depends on aerobic decomposition of the straw over a period of several weeks or months. Also, since dry straw floats and is easily blown around by the wind, it is therefore most effective to introduce the straw as intact bales in the late fall or early spring preceding the summer period for which algae control is desired. Straw bales (approx. 20 kg) can be tied to stakes at the shore and allowed to waterlog over a period of a few weeks (or months under ice cover). In early summer, the bales are pulled to the surface, cut open and roughly distributed in the near-shore zone of the pond. Because they were previously allowed to waterlog, there is little or no straw floatation and aesthetic problems are minimized. At 65 g/m^3, evidence of the straw addition is difficult to see after 2-3 weeks. Although initial work was done with barley straw, apparently straw of any of the other small grains (wheat, oats, flax) is equally effective (P. Barrett, Univ. of Bristol, pers. comm.).

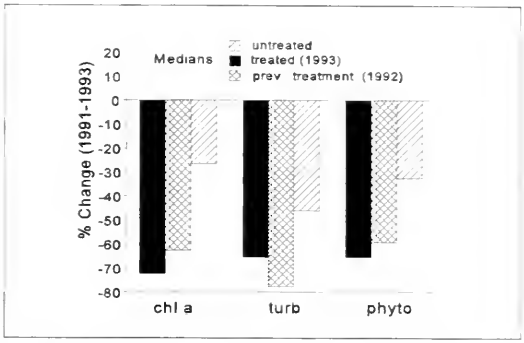

Figure 2 Percentage change in chlorophyll concentrations, turbidity and phytoplankton biovolume between 1991 and 1993 in ponds treated with straw and in untreated reference ponds. The treated ponds include four ponds treated in 1992 but not in 1993.

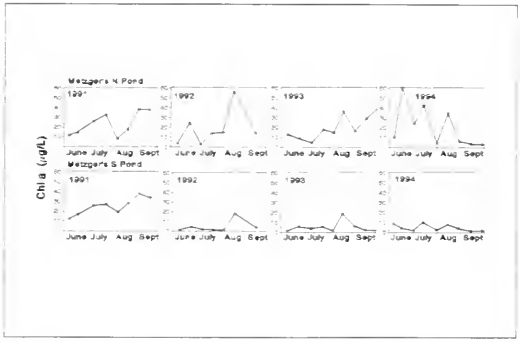

Figure 3 Chlorophyll concentrations in a set of paired ponds. Metzger's N pond (untreated "upstream" reference pond) and Metzger's S pond which was treated with straw at 65 g m^3 in 1992.

A full account of the experimental work will be submitted for publication in 1996.

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